The history of facial palsy and spasm

Hippocrates to Razi

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ABSTRACT

Although Sir Charles Bell was the first to provide the anatomic basis for the condition that bears his name, in recent years researchers have shown that other European physicians provided earlier clinical descriptions of peripheral cranial nerve 7 palsy. In this article, we describe the history of facial distortion by Greek, Roman, and Persian physicians, culminating in Razi's detailed description in *al-Hawi*. Razi distinguished facial muscle spasm from paralysis, distinguished central from peripheral lesions, gave the earliest description of loss of forehead wrinkling, and gave the earliest known description of bilateral facial palsy. In doing so, he accurately described the clinical hallmarks of a condition that we recognize as Bell palsy. ***Neurology*® 2011;77:174–178**

In 1821, Sir Charles Bell described the anatomy of the facial nerve and its association with the unilateral facial palsy that bears his name. Peripheral facial nerve palsy was, however, described by earlier physicians such as Sydenham, Stalpart van der Wiel, Douglas, Friedreich, and Thomassen à Thuessink.[1,2] Although allusions to facial nerve disorders can be traced to Hippocrates, the first comprehensive description was by the 9th-century Persian physician Razi. We here describe the history of facial distortion by Greek, Roman, and Persian physicians, culminating in Razi's description in *al-Hawi*.

METHODS Medline, Google, and Google Books were searched for the terms "cranial nerve," "facial nerve," "facial palsy," "Bell's palsy," or "facial paralysis" and "history." Existing English translations of Greek and Roman works were used. Relevant chapters of Tabari's *Ferdos-ol Hokame,* Razi's *al-Hawi,* Majusi's *Kitab al-Maliki*, Ibn Sina's *Ghanoon Dar Teb*, Akhavini's *Hedayeh Motealemin fi al-Tibb*, and Jorjani's *Zakhireye Khawrazmshahi* were studied. Portions of Tabari's *Ferdos-ol Hokame* and Razi's *al-Hawi* were translated from Persian to English by the authors.[3,4]

FACIAL PALSY AND SPASM IN GREEK AND ROMAN TIMES The early Greek physicians gave brief accounts of these disorders. In the book *Prorrhetics II*, Hippocrates (5th century BCE) stated, "Distortions of the face, if they coincide with no other disorder of the body, quickly cease, either spontaneously or as the result of treatment. Otherwise there is paralysis."[5] Areteaus (Greek physician, 1st century CE) described paralysis, including parts of the face: "Wherefore, the parts are sometimes paralyzed singly, as one eye-brow, or a finger, or …."[6] Areteaus described facial paralysis involving multiple cranial nerves and described cynic spasm, a condition of unilateral facial muscle spasms: "But the distortion of the eye-brows, and of the cheeks, and of the muscles about the jaws and chin to the other side, if attended with spasm, has got the appellation of cynic spasm …. But there is apt to be deception in cynic spasm; for to the spectator it appears as if the parts unaffected were those possessed by the disease." Aulus Cornelius Celsus (1st century CE) also described cynic spasm: "Again, about the face there originates an affection which the Greeks call 'dog spasm,' and it begins along with acute fever; the mouth is drawn to one side by a peculiar movement."[7] Archigenes (1st or 2nd century CE) also gave an account of facial paralysis in conjunction with cynic spasm.[8]

Galen (2nd century CE) advanced neuroanatomy through dissection and vivisection of the ox and Barbary macaque,[9–11] providing observations that were the basis for later physicians. Galen described spasm of the "lips, eyes, skin of the forehead, cheeks, and root of the tongue,"[11] hemifacial paralysis associated with brain lesions, and isolated paralysis of specific areas ("tongue, eyes, jaws, or lips"). Galen's knowledge of specific lesions of the nervous system mostly derived from vivisections; he transected individual nerves and observed

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the results[9] and thereby made the important observation that "if the muscle which moves the right side of the lip is paralyzed, then this part of the lip is pulled over to the left side."[10] Vivisection of particular nerves may explain why Galen's observations were related to specific muscle groups that are not typically seen clinically.

After Galen, Caelius Aurelianus (5th century CE) separately detailed (probably following Galen's lead) eyebrow, tongue, lip, and jaw muscle paralysis.[12] Regarding isolated upper-lip paralysis, he stated, "when paralyzed is turned outward and protrudes most when the patient laughs or talks; for it is then contracted together with the sound lower lip. And it causes what the patient drinks to flow out. Some have identified this condition with cynic spasm, but they are in error." As opposed to these isolated areas of paralysis, Aurelianus described cynic spasm as a spastic process affecting groups of facial muscles. "In cynic spasm a twitch or contraction comes suddenly and passes away without any bodily disturbance. Sometimes the twitch is at the end of the lip or corner of the mouth and continually draws the cheek backward, so that the patient seems to be laughing; at other times the eyebrows, eyelids, and nostrils are subjected to the spasm, and even the neck and shoulders …."

No Greek or Roman physician described classic facial palsy. Distortion on one side can be caused by ipsilateral spasm or contralateral paralysis, and Areteus' description seems to confuse these 2 conditions (in paralysis and not spasm it is the "distorted" side that is healthy). Our modern diagnosis of hemifacial spasm can explain unilateral facial spasm, whereas cephalic tetanus, a localized form of tetanus that can spontaneously resolve, could explain both spasm and muscle weakness with "cynic spasm" as described by Archigenes.[13–15]

With the decline and fall of the Roman Empire, much of the scientific heritage of ancient Greece and Rome was lost. However, translations into Syriac by Nestorian Christians preserved many Greek texts. The contact of Nestorian Christians with Sassanid Persia had begun on the Eastern border of the Roman Empire (from cities such as Nisbis and Edessa) in the pre-Islamic era. Jundishapur was the seat of some of this activity; by 610 CE, a major medical and philosophical conference convened there.[16] After the rise of Islam and the Arab conquest of Persia (651 CE), the patronage of the new Arab ruling class supported renewed efforts to translate the ancient Greek and Roman texts in the Syriac language, as well as in the new lingua franca, Arabic. Translations and new medical treatises were largely the work of non-Arab Muslims (Persians) and non-Muslims (Jews and Christians).[17]

TABARI AND THE FIRST ACCURATE DESCRIPTION OF ISOLATED FACIAL PALSY Abu al-Hasan Ali ibn Sahl Rabban al-Tabari (?–870 CE) was a Persian physician known as Tabari. There is scant information about Tabari's personal life, but it appears, based on his name "ibn Rabban" and a passing reference in his writing, that his father was Jewish and a physician and that he was from Tabaristan in Persia.[3] Tabari stated that he came from a tradition of doctors and that he first learned this profession from his father.[3] Later, he studied Syriac texts and gathered the knowledge of Galen, Hippocrates, Aristotle, Ibn Masawaih, and Hunayn ibn Ishaq as well as Indian medicine in his textbook.[3]

In his work *Ferdos-ol Hokame*, the first comprehensive encyclopedic medical textbook after the Arab conquest of Persia, there is a section on paralysis and tremors,[3] in which Tabari mentioned and extended on Galen. "If half of the face becomes paralyzed, it will be drawn to the healthy side, because the muscles that are healthy are strong, and will pull the paralyzed muscles toward itself." Tabari described the clinical syndrome of facial palsy according to Galen's anatomic findings, although the emphasis was not on focal weakness but rather on the entire half of the face. Facial paralysis was treated as a completely separate disorder, neither described with spasm nor with involvement of other body parts. Tabari thus appears to give the first known accurate description of isolated facial palsy.

RAZI AND HIS DESCRIPTION OF FACIAL PALSY AND SPASM Abu Bakr Muhammad ibn Zakariya Razi (Persian physician known as Razi, 865–925 CE) was active during Samanid-era Persia. He was born in the city of Rey (close to current-day Tehran) and practiced medicine in Rey and Baghdad. Razi placed a high regard on ethical behavior in both his practice of medicine and his scholarly activities. He made a point of providing detailed references and being even-handed and was well-known for being meticulous in citing work that was not his own.[17]

In the sixth book of *al-Hawi*, there is a chapter entitled, "Facial distortion, spasm and paralysis." This drew on his observations and those of more than 20 authors, including Archigenes, Galen, Celsus, Jurjis, Bukhtishu II, al-Yahudi (Masargawaih), Yahya ibn Sarafyun (Serapion the Elder), and Ibn Masawaih. Razi provided accurate descriptions of facial muscle disorders, beginning with Galen's description of facial spasm and paralysis. Razi (like

Tabari) treated facial distortion as a primary problem, even omitting Galen's description of extremity paralysis that was tied to Galen's initial description of facial palsy.

Differentiating facial paralysis from spasm. Razi wrote, "It is important, based on their special signs and symptoms to separate the two even if there is not much [practical] importance in differentiating them and both their treatments are one . . . . " Razi stated that with spasm, the uvula was involved and that the muscles of the temples, cheeks, and forehead were hardened with tremors. In a different section, he wrote, "According to my observations, I have found out that the wrinkles on the forehead of the affected side disappear and the skin in that area is pulled strongly. The source of facial distortion is either spasm or paralysis, and these two can be differentiated by pain, as the paralytic type is without pain." Here, Razi describes a clinical method for distinguishing spasm and paralysis. In addition, this appears to be the first description of the loss of wrinkling that is currently used to distinguish peripheral from central seventh nerve palsy (though he did not infer etiology).

Notably missing among Razi's references is Tabari. Razi does, however, quote Tabari's contemporary, Bolus (physician of the Abbasid Caliph Al-Mu'tasim, 9th century CE): "paralysis is not seen on the distorted side of the face; rather, it is on the opposite side." Razi also quoted Ibn Batrigh (Arab physician known as Eutychius, 877–940 CE): "the patient's face while smiling is crooked, and the eye on the affected side is sunken in, small, and always has tears running down it. The patient chews food on the unaffected side, they speak softly, and have a depressed mood."

Razi also gave the earliest description of bilateral facial palsy: "I have seen a man who . . . . was affected by a type of facial distortion in which his face was not crooked, but one of his eyes he could barely close and his other not at all, and when drinking, water would flow from his mouth. The lack of his crooked appearance was because both sides were affected by the disease."

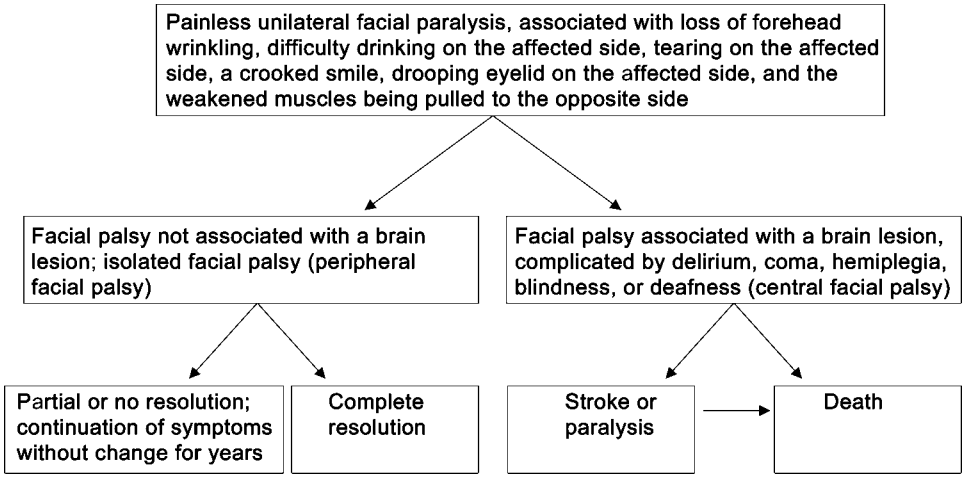
Differentiating central from peripheral lesions and prognostic factors. Razi devoted a section to prognostic factors related to differentiating central from peripheral lesions. Razi separated central and peripheral lesions on the basis of the presence or absence of involvement of other symptoms and areas (brain involvement, level of consciousness, extremity involvement, blindness, and deafness). "Some patients, following facial distortion, suffer from a stroke, some die, and some develop paralysis . . . . Thus, pay attention and if the facial distortion is attended by confusion and difficulty in moving the body or limbs," then immediate treatment is needed. In another section he expands on this: "A patient with facial distortion does not lose their sense of sight or hearing, and their sensation in their face is neither increased nor decreased, thus they do not have a brain lesion." Elsewhere, Razi stated that if the brain is involved, the patient is in danger of death and has symptoms such as loss of vision and hearing.

Treatment. The treatments recommended for facial palsy and spasms were similar. Razi gave his own treatments and referenced many others. These treatments included massage until the "skin turns red," warming oils and ointments, warm compresses, inhaled and intranasal medicines (emphasis on inducing sneezing), oral medications (emphasis on gargling), laxatives, special diets, phlebotomy, and application of a bandage to the distorted area to counteract the unbridled pull of the muscles. The patient was to rest and stay in a warm dark room. Razi realized that the condition could be self-limited: "I have seen more than one case of facial distortion in which the patient in no way rested at home, did not stay in the dark, continued doing their daily routine, and got better."

Long-term complications and follow-up. Razi believed that the treatment could last up to a month, but "if six months passes after the start of the facial distortion, and it is unchanged, it is unlikely to resolve." He continued, "Although I have seen some elderly who claim they have had this disease for more or less 30 years and have not been harmed from it in any way; and others who had this for 10 years. I have seen five others that have not had any problems from the beginning of the disease." It is interesting that 6 months is the time by which complete or partial recovery can occur in Bell's palsy.[18]

DISCUSSION Although Greek, Roman, Persian, Nestorian, Jewish, and Arab physicians made contributions to the understanding of disorders involving facial muscles, Razi provided the first comprehensive work. Mettler summarizes the Greek and Roman era as follows: "Facial paralysis caused the ancients more trouble than other types. While good accounts appear in Caelius and Aretaeus, and while Galen surmised that different portions of the face must be innervated by separate nerves, the real issues involved were not apprehended until well after Bell's time."[7] Although accurate overall, this summary overlooks Galen's contributions, the basis for observations of later physicians.

Figure Facial palsy as described by Razi in *al-Hawi*



Razi provides an accurate description of facial palsy, differentiates central from peripheral causes (although not based on loss of forehead wrinkling), and provides potential complications for each. Modern equivalents of Razi's observations are shown in parentheses.

Galen's key observations laid the groundwork for Tabari's description of isolated facial palsy. Perhaps Razi's omission of Tabari occurred because Razi gave credit for the description of facial palsy to Galen. Razi, however, went into much more detail than Tabari, explicitly dividing facial distortion into spastic and paralytic disorders, describing central and peripheral palsy, and giving the first apparent description of loss of forehead wrinkling and bilateral facial palsy.

The recent article by Shoja et al.[19] provides a translation of *al-Hawi* regarding facial palsy. In this work there is no mention of spastic vs paralytic disorders or of Razi's references to other physicians (Galen's description is credited as Razi's), and at one point the authors point to Razi's confusing the trigeminal and facial nerves. Upon review of their translated portions, these inconsistencies seem to arise from the translation of an abridged version of that section (pp 289–291), rather than use of the primary text (pp 117–128).[4] Because of Razi's detailed notes and references and our use of primary texts, we are confident that the description of facial palsy in *al-Hawi* is accurate and the most complete definition of that time (figure). However, our research was based on existing and available texts, and it is possible that we have left out the contribution of other physicians that may later come to light.

Razi's observations quickly became standard knowledge for later physicians. Persian physicians, such as Ibn Sina (980–1037 CE) and Jorjani (1040–1136 CE), reiterated condensed versions of *al-Hawi*, at times verbatim and without identifying the source.[19–22] Interestingly, Jorjani and Ibn Sina advanced the knowledge of cranial nerves; however, the facial nerve was still paired with the acoustic nerve as in Galen's classification.[23]

Razi's *al-Hawi* was first translated into Latin in 1279, coming into print in Europe in 1468.[24] Perhaps because of its sheer size or the fact that it was never finished and put together posthumously,[17,23] *al-Hawi* never became widely available in Europe. Regardless, Ibn Sina's *Canon*, which was more systematic and understandable than *al-Hawi*, was the main textbook in many medical schools between the 14th and 16th centuries, and thus those physicians should have been exposed to Razi's ideas. However, it is not known whether European physicians directly built on these early descriptions of facial palsy. Three quarters of a millennium would pass before others fully described the clinical syndrome, culminating with Bell's seminal observation of the anatomic basis for the disorder.[1,2]

AUTHOR CONTRIBUTIONS

M.M.S., M.-R.M.S., and S.M.T. provided the study concept or design. M.M.S. acquired the data and analyzed or interpreted data. M.-R.M.S. supervised the study. M.M.S., M.-R.M.S., and S.M.T. drafted/revised the manuscript.

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